II Year B.Tech. Chemical Engg. - I-Semester	**L**	**T**	**P**	**To**	**C**
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CH217 CHEMICAL PROCESS CALCULATIONS

Course Description & Objectives:

The course continues to develop concepts and provides a more extensive treatment of energy balances. Students develop a fundamental understanding of the basic principles of chemical engineering processes and calculations. (memory, comprehension). Students can examine and select pertinent data, and solve material and energy balance problems. (application, analysis, synthesis).

Course Outcomes:

1. *The student does material & energy balances, either over a single processing unit or and / or over the entire plant.*
2. *The input, output data (material or energy) calculated through this subject can be used to further problem for individual design or collective appraisal.*
3. *A material – energy audit is hinted at several stages in this subject, which is later used to design the equipment – like dryers, absorbers, distillation columns, crystallization etc.*

UNIT I - Stoichiometric Relations

Basis of calculations, Methods of expressing composition of mixtures and solutions, Mole fraction and mole percent density and specific gravity, Baume and 'API' gravity scales.

Behaviour of ideal gases: Kinetic theory of gases, application of ideal gas law, gaseous mixtures gases in chemical reactions. Gas densities and specific gravities.

UNIT II - Vapour Pressure

Liquefaction and liquid state, vaporization, boiling point, effect of temp on vapor pressure, Antonie equation, vapor pressure plots, vapor pressure of immiscible liquids and ideal solutions, Raoult's law, non volatile solutes.

UNIT III - Material Balances

Tie substance, yield and conversion, processes involving chemical reactions material balance calculation involving drying, dissolution and crystallization, Process involving recycles bypass and purge.

UNIT IV - Thermo Physics

Energy, Energy balances, heat capacity of gases, liquid and mixture solutions, Kopp's rule, latent heats, heat of fusion and heat of vaporization, trouton's rule, kistyakowski equation for non polar liquids, enthalpy and its evaluations.

UNIT V - Thermo Chemistry

Calculation and applications of heat of reaction, combustion, formation and neutralization, Kirchoff's equation, enthalpy concentration change, Calculation of theoretical and actual flame temperatures.

TEXT BOOKS

1. Hougen O.A Watson K.M and Ragatz .R.A, "Chemical Process Principles" Part – I: Material and Energy Balance ,John Wiley sons, 2nd ed., CBS Publishers & Distributors, 1965.
2. V. Venkataramani & N.Anantharaman,"Process Calculations", 1st ed., PHI Publications, 2003.

REFERENCE BOOKS

1. B.I.Bhatt and S.M.Vora, "Stoichiometry", 4th ed., Tata McGraw Hill, New Delhi 2004.
2. D.H.Himmelblau, "Basic Principles and Calculations in Chemical Engineers", 5th ed., Prentice Hall, 1989.